CLAIMS

1. A wire bonded structure comprising:

a first bonding area, a second bonding area and a third bonding area respectively provided on first, second, and third components;

a first wire bond between said first and said second bonding areas;

a second wire bond between said second and said third bonding areas; and

at least one of first and second wire bonds at said second bonding area being on top of the other of said first and second wire bond at said second bonding area.

2. A structure as in claim 1 wherein at least one of said components is an integrated circuit chip.

3. A structure as in claim 1 wherein said first component is a substrate and said second and third components are integrated circuit chips.

4. A structure as in claim 1 wherein said first, second and third components are stacked.

5. A structure as in claim 1 wherein at least two of said first, second and third components are in the same plane.

6. A structure as in claim 5 wherein each of said first, second and third components are in the same plane.

7. A structure as in claim 3 wherein said integrated circuit chips are stacked over said substrate.

8. A structure as in claim 1 wherein a ball bond is at one end of each of said first and second wire bonds.

9. A structure as in claim 8 wherein a bump is at the other end of each of said first and second wire bonds.

10. A structure as in claim 1 wherein an imaginary line drawn along a longitudinal axis of said first wire bond and an imaginary line drawn along a longitudinal axis of said second wire bond are not parallel.

11. A structure as in claim 10 wherein an intersection between said imaginary lines forms an angle in a horizontal plane.

12. A structure as in claim 10 wherein an intersection between said imaginary lines forms an angle in a vertical plane.

13. A structure as in claim 10 wherein an intersection between said imaginary lines forms an angle in vertical and horizontal planes.

14. A wire bonded structure comprising:

a substrate, a lower chip positioned over said substrate, and an upper chip positioned over said lower chip, each of said substrate, lower chip and upper chip having exposed bonding pads;

a first wire bond formed from a bonding pad of said substrate to a bonding pad of said lower chip;

a second wire bond formed from said bonding pad of said lower chip to a bonding pad of said upper chip and electrically connected to said first wire bond; and

wherein said first wire bond and said second wire bond are configured such that an imaginary line drawn between endpoints of said first wire bond and an imaginary line drawn between endpoints of said second wire bond are not parallel.

15. A structure as in claim 14 wherein an intersection between said imaginary lines forms an angle in a horizontal plane.

16. A structure as in claim 14 wherein an intersection between said imaginary lines forms an angle in a vertical plane.

17. A structure as in claim 14 wherein an intersection between said imaginary lines forms an angle in horizontal and vertical planes.

18. A wire bonded structure comprising:

a first conductive bump on a first bonding surface;

a first ball bond on a second bonding surface;

a first wire bond extending from said first ball bond to said first conductive bump;

a second conductive bump on a third bonding surface;

a second ball bond on said second bonding surface in electrical communication with said first conductive bump; and

a second wire bond between said second ball bond and said second conductive bump.

19. The structure of claim 18 wherein said second ball bond is on top of said first conductive bump.

20. The structure of claim 18 wherein said first and second wire bonds are gold wire bonds.

21. The structure of claim 18 wherein said second wire bond is at an angle with respect to said first wire bond in a vertical plane.

22. The structure of claim 18 wherein said second wire bond is at an angle with respect to said first wire bond in a horizontal plane.

23. The structure of claim 18 wherein said second wire bond is at an angle with respect to said first wire bond in vertical and horizontal planes.

24. A method of wire bonding, said method comprising:

forming a first wire bond between first and second components;

forming a second wire bond between said second component and a third component such that said second wire bond is in electrical communication with said first wire bond; and

connecting at least one of said first and second wire bonds on at least one end using a ball bond.

25. The method of claim 24 further comprising connecting the other of said at least one of said first and second wire bonds on at least one end using a ball bond.

26. The method according to claim 24 further comprising bonding a first bump to said second component prior to forming said first wire bond.

27. The method according to claim 26 further comprising forming said first wire bond by forming a first ball on said first component and extending a wire bond from said first ball to said first bump.

28. The method according to claim 27 further comprising forming a second bump on said third component prior to forming said second wire bond.

29. The method according to claim 28 further comprising forming a second ball in electrical contact with said first bump.

30. The method according to claim 29 further comprising forming said second wire bond by extending a wire from said second ball to said second bump.

31. The method according to claim 24 wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.

32. The method according to claim 24 wherein said second wire bond is formed at an angle with respect to said first wire bond in a vertical plane.

33. The method according to claim 24 wherein said second wire bond is formed at an angle with respect to said first wire bond in horizontal and vertical planes.

34. A method of wire bonding comprising:

forming a first conductive bump on a first surface;

forming a first ball bond on a second surface;

forming a first wire bond from said first ball bond to said first conductive bump;

forming a second conductive bump on a third surface;

forming a second ball bond on said first surface in electrical communication with said first conductive bump; and

forming a second wire bond from said second ball bond to said second conductive bump.

35. The method of claim 34 wherein said second ball bond is formed on top of said first conductive bump.

36. The method of claim 34 wherein said second wire bond is formed at an angle with respect to said first wire bond in a vertical plane.

37. The method of claim 34 wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.

38. The method of claim 34 wherein said second wire bond is formed at an angle with respect to said first wire bond in horizontal and vertical planes.

39. The method of claim 34 wherein the method steps are performed with a wire bonding apparatus.

40. The method of claim 39 wherein said wire bonding apparatus executes a software program to perform the method steps.

41. The method of claim 40 wherein said software program is executed in a controller of said wire bonding apparatus.

42. An apparatus for making wire bond connections between components, said apparatus comprising:

a device for feeding a wire, said device adapted to form ball bonds and wire bonds;

a mechanism for moving and operating said device such that said device forms a first wire bond from a first surface to a second surface, and forms a second wire bond from said second surface to a third surface, wherein said first and second wire bonds are electrically connected on said second surface.

43. The apparatus according to claim 42 wherein said device is a capillary.

44. The apparatus according to claim 42 further comprising a drive unit for moving said device.

45. The apparatus according to claim 44 further comprising a controller for controlling said drive unit.

46. The apparatus according to claim 45 further comprising computer software for said controller for enabling wire bonding.

47. The apparatus according to claim 42 wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.

48. The apparatus according to claim 42 wherein said second wire bond is formed at an angle with respect to said first wire bond in a vertical plane.

49. The apparatus according to claim 42 wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane and a vertical plane.

50. A wire bonding apparatus comprising:

a controller for controlling a wire bonding device such that said device forms a first conductive bump on a first conductive surface, a first ball bond on a second conductive surface, a first wire bond from said first ball bond to

said first conductive bump, a second conductive bump on a third surface, a second ball bond on said second conductive surface in electrical communication with said first conductive bump, and a second wire bond from said second ball bond to said second conductive bump.

51. The apparatus according to claim 50 wherein said wire bonding device is a capillary.

52. The apparatus according to claim 50 further comprising a drive mechanism for moving said wire bonding device.

53. The apparatus according to claim 50 further comprising a measuring device for measuring movements of said wire bonding device.

54. The apparatus according to claim 50 further comprising a software program for performing wire bonding for said controller.

55. The apparatus according to claim 50 wherein said second wire bond is formed at an angle with respect to said first wire bond in a vertical plane.

56. The apparatus according to claim 50 wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.

57. The apparatus according to claim 50 wherein said second wire bond is formed at an angle with respect to said first wire bond in vertical and horizontal planes.